Ricerche e progetti per il territorio, la città e l'architettura
ISSN 2036 1602
NUMERO 8 - dicembre 2015

ET IN ARCADIA EGO. Eseguire musica come architettura

ET IN ARCADIA EGO. Performing Music as Architecture

Katerina Michalopoulou
Architect. Diploma/Msc at National Technical University of Athens (NTUA). PHD candidate (NTUA) and postgraduate student in Digital Arts (A.S.F.A.). She teaches at the Technological Educational Institute of Athens. She has participated and has been presented with awards in international and nationwide competitions, conferences and architectural project exhibitions.

Antonis Touloumis
Architect. Diploma and Msc in Architectural Engineering at National Technical University of Athens (NTUA). PHD candidate of NTUA and postgraduate student in Digital Arts of Athens School of Fine Arts. He has participated and has been presented with awards in international and nationwide competitions, conferences and architectural project exhibitions

Siamo in grado di eseguire un movimento rituale verso una tomba? È possibile per una tomba, che esprime tipicamente il corpo a riposo, inscrivere simultaneamente il movimento dei vivi?
Attraverso il nostro progetto, consideriamo l'idea di progettare tombe che agiranno come spartiti musicali, cioè elementi che determinano il nostro movimento dandone un senso rituale. Diversi impulsi cardiaci che corrispondono a diverse età sono legate ai ritmi della musica e, infine, diventano ritmi di passo. L'idea di progettare esperienze temporali attraverso elementi architettonici si riferisce anche alla progettazione di camere funerarie. Sulla base dell'idea di simultaneità, sono progettati come sepolture parallele. Trame circolari definiscono il nostro progetto, perché esse sono sempre state legate a movimenti rituali. Inoltre, essi sono legati alle strutture idriche sotterranee come i pozzi.

Are we capable of performing a ritual movement towards a tomb? Is it possible for a tomb which typically expresses the resting body, to inscribe simultaneously the movement of the living?
Through our project we offer for consideration the idea of designing tombs that will act as music scores, that is, elements that prescribe our movement towards them giving it a ritual sense. Different cardiac pulses that correspond to different ages are linked to music rhythms and finally become rhythms of stepping.
The idea of designing temporal experience through architectural elements refers to the design of burial chambers as well. Based on the idea of simultaneity, they are designed as parallel burials. Circular patterns define our design since they have always been related with ritual moves. Furthermore they are linked to underground hydraulic structures such as wells.

Parole chiave: **Architettura; Musica; Ritmo; Rituale; Sepoltura**
Keywords: ***Architecture; Music; Rhythm; Ritual; Burial***

BY-NC

Ricerche e progetti per il territorio, la città e l'architettura
ISSN 2036 1602
NUMERO 8 - dicembre 2015

I. Introduction

E. Panofsky starts the 7th chapter of his book "Meaning in the Visual Arts" with an event of great importance, which takes place in 18th century England: it is the reaction of King George III when he saw the painting of sir Joshua Reynolds «Mrs. Bouverie and Mrs. Crewe», which depicts the two lovely ladies seated before a tombstone and sentimentalizing over its inscription: Et in Arcadia ego (Fig. 1). King said at once: "Oh, there is a tombstone in the background: Ay, ay, death is even in Arcadia". King's interpretation implies, a present happiness menaced by death and comes in contradiction with our modern reading of the "Et in Arcadia ego" message: the retrospective vision of an unsurpassable happiness, enjoyed in the past, unattainable ever after, yet enduringly alive in the memory: a bygone happiness ended by death.

Panofsky shows that this royal rendering "Death is even in Arcadia" represents a grammatically correct, in fact, the only grammatically correct, interpretation of the latin phrase Et in Arcadia ego, and that our modern reading of its message " I too, was born, or lived, in Arcady" is in reality a mistranslation. Panofsky renders responsible for this change in interpretation not a man of letters but a great painter: Nicolas Poussin (Fig. 2). Poussin's paintings on the theme no longer show a dramatic encounter with Death but a contemplative absorption in the idea of mortality (Panofsky, 1955).

Contemplation was the answer to all the fundamental issues we encountered in order to design our proposal for a burial monument. Because we believe that contemplation needs that intermediate space and time where alive and dead co-exist literally and metaphorically. The immersion in a space-time environment where we may contemplate on the idea of mortality could attribute our cultural identity to contemporary death care (Fig. 3).

The renowned artist J. Kounellis comments regarding the issue of death: "the dead do not exist anymore. And this is serious because death in all respects, including death care, has always been a sign of a particular culture". Another artist, Lucas Samaras, will add: "Art making is a ritual, almost a religious act". Our belief that the reverse also occurs i.e., the religious element flows into art, gave us the idea of designing a ritual movement directly referred to the spatial elements of the burial (Fig. 4).

II. The structure

We applied all the previous considerations to the design of a burial monument (Fig.5). Easy and economical construction, were among our basic design specifications. We chose the option of prefabrication. The selected

Fig. 1 *Mrs. Bouverie and Mrs.Crewe*, Joshua Reynolds

BY-NC

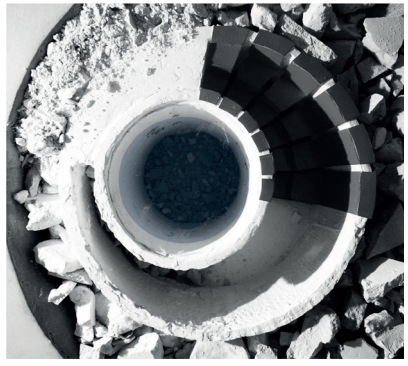
in bo Ricerche e progetti per il territorio, la città e l'architettura
ISSN 2036 1602
NUMERO 8 - dicembre 2015

Fig. 2 Giovanni Francesco Guercino's and Nicolas Poussin's, *Et In Arcadia Ego*

Fig. 3 Model of the project

BY-NC

Ricerche e progetti per il territorio, la città e l'architettura
ISSN 2036 1602
NUMERO 8 - dicembre 2015



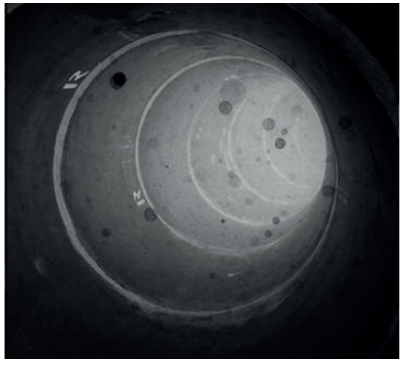


Fig. 4 References from Land Art· *Building for a void* Anish Kapoor 1992, *Sun Tunnels* Nancy Holt 1973-76 and *Nomad Circle* Richard Long Mongolia 1996

Fig. 5 Plan view of the model

Fig. 6 References of prefabrication

BY-NC

Ricerche e progetti per il territorio, la città e l'architettura
ISSN 2036 1602
NUMERO 8 - dicembre 2015

basic structural precast elements, follow international specifications and dimensions which enables them to be found anywhere without any special order.

The burial chamber

Two prefabricated concrete pipes, of different diameter and height, are driven into the ground with their nozzles set vertically, in a conical trench. The first one, which has a diameter of 1.4 meters and height of 2.5 meters, is the burial chamber. The dead body is placed in an embryonic position, related with the circular shape of the grave (Fig. 6)
Its interior is divided into three spaces by two fully detachable horizontal planes. The body is deposited at the highest level which is formed by a suspended cast iron grid. The design of its frame refers to the human skeleton as it retains the body allowing, over time, the passage of bones to the second lower level. This one is also formed by a cast iron grid of denser frame which retains only the bones. The third and final level is located on the ground where the rest of the remains end up, to be transformed naturally into usable organic matter (Fig. 7). The cap of the container is made of steel plate, shaped as a concave hemisphere, which serves as a pot for stagnant fluid (*choes*) or a slot with etchings that create a sundial.
So, the idea of designing the temporal experience through the notation of

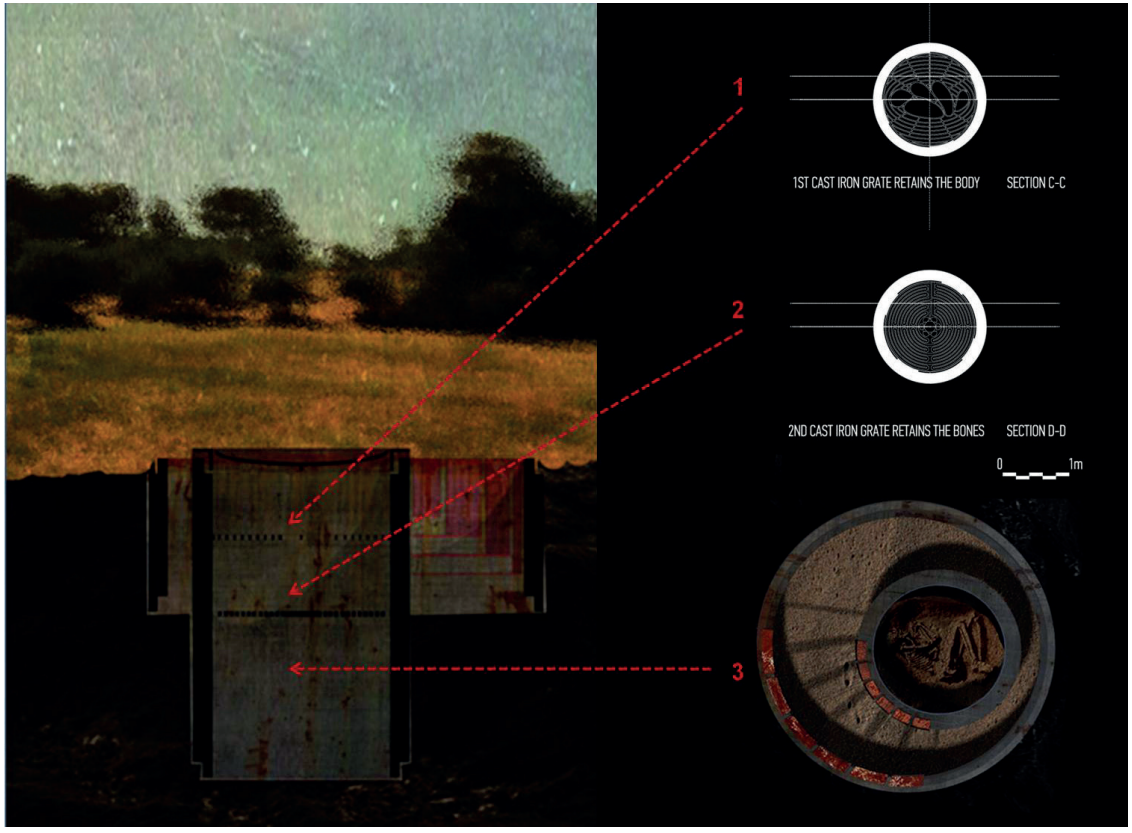


Fig. 7 Inner Structure, sections and plan views of the two grates

BY-NC

in bo Ricerche e progetti per il territorio, la città e l'architettura
ISSN 2036 1602
NUMERO 8 - dicembre 2015

embodied movement is enhanced by the construction of the burial chamber's cap which is designed as a sundial recording the ontological mechanical time or even as a water reflecting surface that brings heavens to earth by reversing the spatial and temporal boundaries. In this sense, the descent to earth acquires the concept of the reverse ascent to sky (Fig. 8).

The burial chamber ensures the possibility of multiple urials even simultaneously, thanks to the successive reuse of the grids. Moreover, burial in the air is considered to be one of the easiest and quickest ways of decay. This burial method founded in antiquity as *"An economic way layout at earliest graves. It is observed in Theisoa (Arcadia - Elis) where Hellenistic tombs, in the form of two-story cist graves, with stone grate as a separator between the two chambers can be found. Previous burial's bones fell or pushed into the lower chamber and the latest body was placed on the grate* (Fig. 9). *This intelligent arrangement, however, is not repeated anywhere else"*. (Kurtz, Boardman, 1971)

Surrounding the Burial

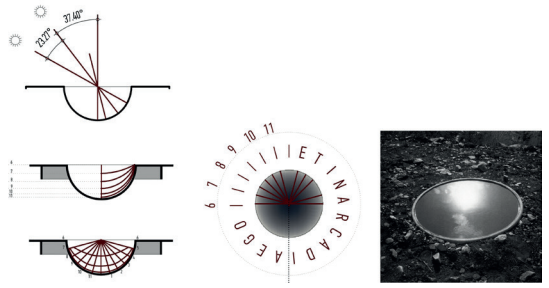
The second concrete ring of larger diameter and lower height surrounds the first. It is located at the slope which is necessary for the trench's construction where the first ring is located, and defines its surrounding. Freedom of association between the two rings ensures the possibility of installing the construction both in horizontal, where the monument incorporated into the ground, and on sloping ground where a part of the outer ring reveals as a retaining wall (Fig. 10).

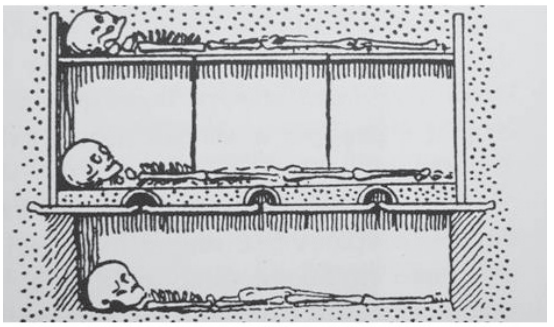
Finally the monument is composed as a prefabrication in two ways:

As a construction, it is considered to be prefabricated since it results from the re-composition or transcription of prefabricated elements used in plumbing works such as, concrete underground water mains, the cast iron drain rainwater harvesting, and suspended visit stairs. As a designed object, it is considered to be a prefabricated structure since it results from the transcription of musical structural elements.

As mentioned, the burial chamber is based on the idea of simultaneity and transcription. It is designed as a simultaneous burial, a burial that has the potential to be used simultaneously for multiple burials due to the compartmentalization of height at three different levels each one of which retains a different kind of remains. Surrounding however, is based on the idea of composing different durations.

Space between the two prefabricated rings is occupied by a removable metal staircase which is formed by autonomous tiers of steel sheets suspended in the two rings. Risers and treads of the stairs, compose the durations of each step.





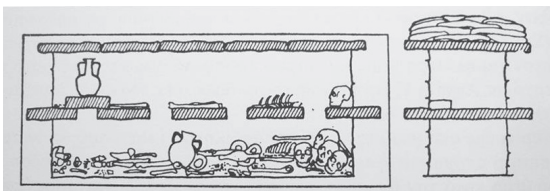


Fig. 8 Sundial's construction depends on place's latitude and reference to *Hydra's Head,* Nancy Holt, 1974
Fig. 9 *Sections of a Hellenistic tomb in Arcadia*, Kurtz, Boardman

BY-NC

Ricerche e progetti per il territorio, la città e l'architettura
ISSN 2036 1602
NUMERO 8 - dicembre 2015

Thus, corresponding rhythms, Pyrrhic, Trochee, Spondee and Iamb are formed. The sound of stepping on the metal sheets, combined with the underlying vacuum (sound box), accompany the ritual. The designed movements relate to the worship of the dead. In an analogous manner as in Antiquity, the procession to the dead is a symbolic descent movement to Hades. An intermediate space is created by this movement, essentially, where the bodies of the dead and the living coexist.

The idea of choreographing the movement through fixed architectural elements such as the staircase may constitute one of the elements that attribute originality to each grave. These are capable of referring to different ages -as in staircases designed- or even to musical rhythms that characterize various ethnicities, etc. (Fig. 11).

Design process enforced the following questions

How can a movement be designed, notated and performed by the use of architectural elements? Could a staircase become such a design element as it inscribes relatively accurately the movement of the human body in it? The idea of a tomb that will act as the music score of ritual dance was born. That is, the embodied movement towards dead is choreographed and repeated in a ritual mode.

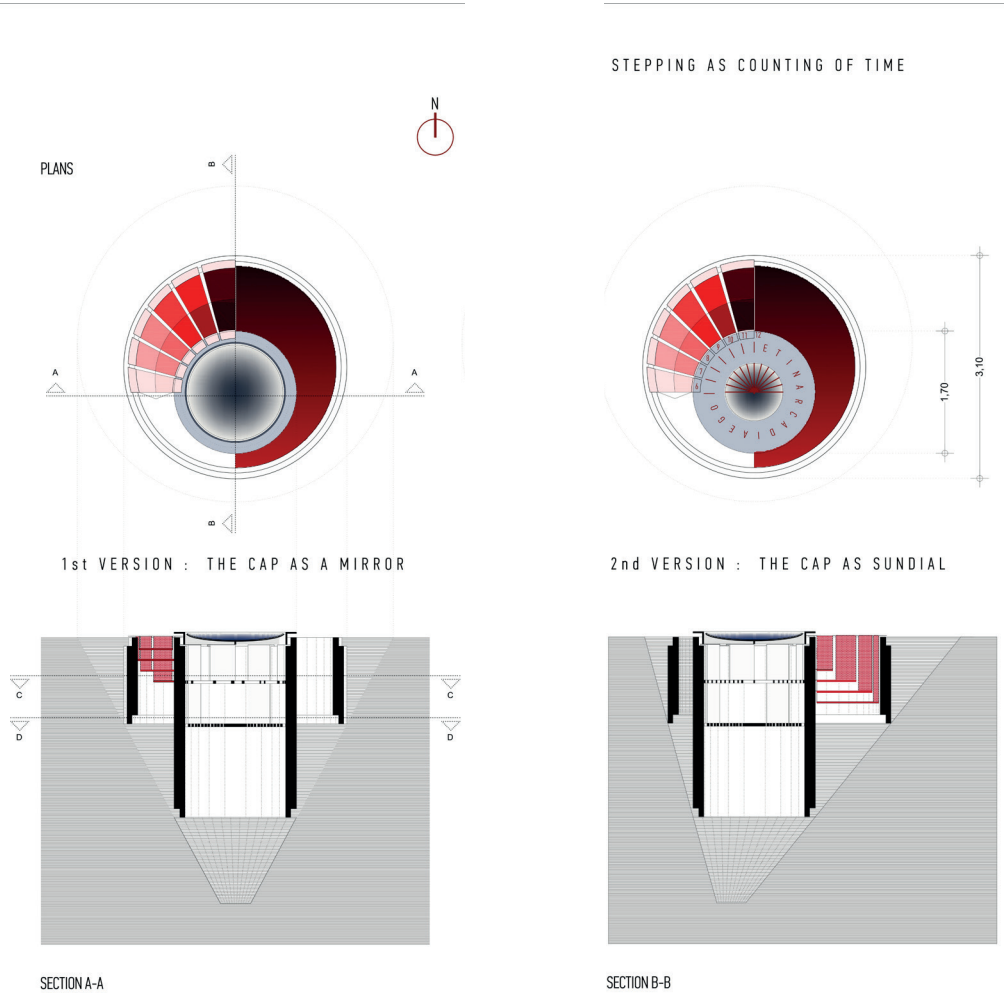


Fig. 10 Plans and sections of the project

BY-NC

Ricerche e progetti per il territorio, la città e l'architettura
ISSN 2036 1602
NUMERO 8 - dicembre 2015

III. Staircase - Rhythm - Pulse

The central architectural issue that we focus on, concerns the way in which the space-time element of the staircase intervenes in shaping our experience. The idea that our experience has a corporal background leads to the exploration of the basic bodily function that affects the movement on the scale, i.e. the stepping.

In our project we composed four staircases that correspond to four ancient rhythms. According to the Greek physician of Hellenistic antiquity, Herophilus, (Daremberg, Ruelle, 1963) pulse of human heart has a rhythmic background. He defined rhythm of the pulse as the ratio of the duration of the artery's diastole to the duration of its systole. Its changes reflected a person's progression from infancy through adolescence, to maturity and old age. Each stage of life had a characteristic cadence (Fig. 12). In particular: Pyrrhic corresponded to heartbeat of infants where diastole has the same short duration of the systole.

Trochee corresponded to the heartbeat of the youth where diastole has a double duration than that of systole.

Spondee corresponded to adult heartbeat where diastole and systole are of equal length.

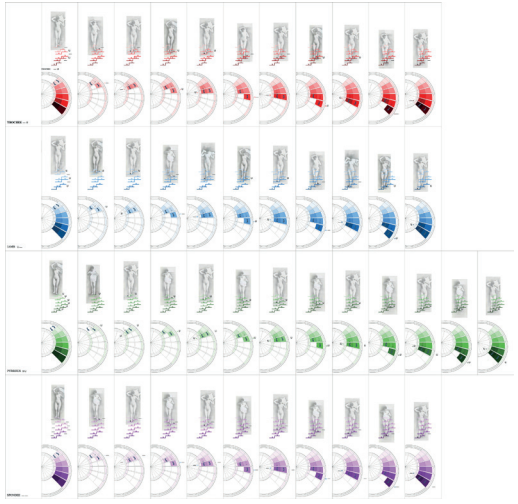
Lamb corresponded to the elderly heartbeat, where the duration of cardiac diastole is half of that of the systole.

In other words, according to Herophilus there is a correspondence between the syllables we utter and the transmissible element of rhythm, the language of life. They both have music structure and are shaped to pyrrhic, trochee, spondee, or iamb.

IV. Movement - Ritual

In Greek Antiquity, the movements associated with the ritual, were inextricably linked with the speech too. Words as sound -material were not only bearers of meanings correlated with experiences of the outside world. (e.g. words referring to water, included the letter 'ρ' associated with the sound of its movement). They bore temporal characteristics too, concerning structural physiological functions of the body. Words extended, configured i.e. organized in time, based on heart rates, breathing and stepping. Thus sound, meaning and motion constituted a signal rhythmic organization. The relation between melody, poetry and dance constituted the ideal type of music. In order to conceive how all the elements contained in the "music", are linked we need to associate them with breathing, heart rate, and stepping. In our study, we shall explore all these elements regarding their rhythmic formation (Fig.13).

V. The relation of respiration and speech enunciation



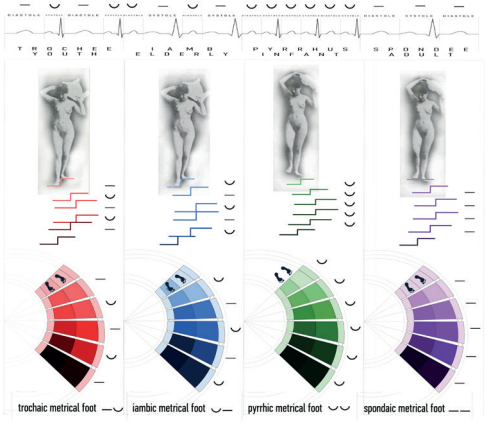


Fig. 11 Diagrams that notate movements in the four staircases corresponding to four rhythms

Fig. 12 Diagrams of four cardiograms corresponding to trochee, iamb, pyrrhus and spondee, four staircases that notate movements according to the aforementioned rhythms

BY-NC

in bo Ricerche e progetti per il territorio, la città e l'architettura
ISSN 2036 1602
NUMERO 8 - dicembre 2015

The organization of speech by respiration concerns all stages of words enunciation, both at syllable and sentence (main or secondary), corresponding to a breath. During the enunciation of successive syllables we exhale continuously (movement), on the contrary when we complete a period we inhale (pause). Every minute we breathe about 9-20 times

Respiration, as the most important among the necessary for human survival, physiological needs, is associated with almost all bodily functions. It is affected and affects for example, cardiac function, body posture, and speech, the process of feeding, digestion, alertness, attention and psychological state. It is controlled by the autonomic nervous system. This means that it occurs spontaneously, without conscious thought or intention. However, it can readily be controlled consciously. So during the speech enunciation, even though there are some physiological limitations (shift, duration and intensity of breathing) we are allowed to self-act and produce a variety of rhythmic respiration patterns.

In ancient Greek Metrics the *"Chronos protos"* (later called "sign") was adopted as the primary time unit which was directly correlated with respiration. Thus Chronos Protos is divisible neither by melody nor by words, or by a body movement (Barker, 1989). In vocal music it corresponds in principle to the (perceived as uniform) duration of a short syllable (U). Chronos protos has a proportional value. Its absolute time value depends on the rate of performing the piece, the "rythmiki agogi" (tempo). So after being related to the duration needed for a syllable to be sung, the time unit is related directly to respiration as it is a subdivision of exhaling.

VI. The Relation between stepping and speech enunciation

We could suppose that the ancient Greek language was based on duration (agogic accent), as far as prosody is concerned i.e. the words were analyzed into long and short syllables. Syllables were formed in allocated groups which were bilateral or trilateral structures consisting of long and short parts. Constructions of this kind were Pyrrhic, Trochee, Spondee and Iamb. Those forms had fixed duration and firm structure. They constituted thus the metre, and yet they prescribed the order of quantitative intonation of rhythm too. Qualitative intonation was based on tonality as in modern music, but through the correlations between vowels and consonants or through the sequence of words. So words by nature determined the rhythmic pattern (West, 1987).

Moreover sound duration of words would refer directly to bodily movement and somehow they notated it since long syllables corresponded to the position of the foot on the ground while the short ones to its lift. Dance was the essential bridge that linked movement to music. J.J. Pollitt referring to this view that had been supported by Eugen Petersen notes:

"Rhythmoi were originally the" positions "that-the human body was made to assume in the course of a dance, in other words the patterns or schemata that the body made. In the course of a dance certain obvious patterns or positions like the raising or lowering of a foot, were naturally repeated, thus making intervals in the dance. Since music and singing were synchronized with dancing, the recurrent positions taken by the dancer in the course of his movements also marked distinct intervals in the music; the rhythmoi of the dancer thus became the rhythmoi of the music. This explains why the basic component of music and poetry was called a pous, "foot" (Plato, Rep. 400a), or basis, "step" (Aristotle, Metaph. L087b37) and why, within the foot, the basic elements were called the arsis, "lifting, up-step," and thesis, "placing, down-step." (Pollitt, 1974)

When we hear, for example a trochaic metre we must imagine some corresponding dance movement or a bilateral movement at the staircase. It is composed of two steps, a big and a small one. In this case, the metre defines the relationship between the weak and strong parts while their shape is determined by the rhythm. Rhythm defines

BY-NC

Ricerche e progetti per il territorio, la città e l'architettura
ISSN 2036 1602
NUMERO 8 - dicembre 2015

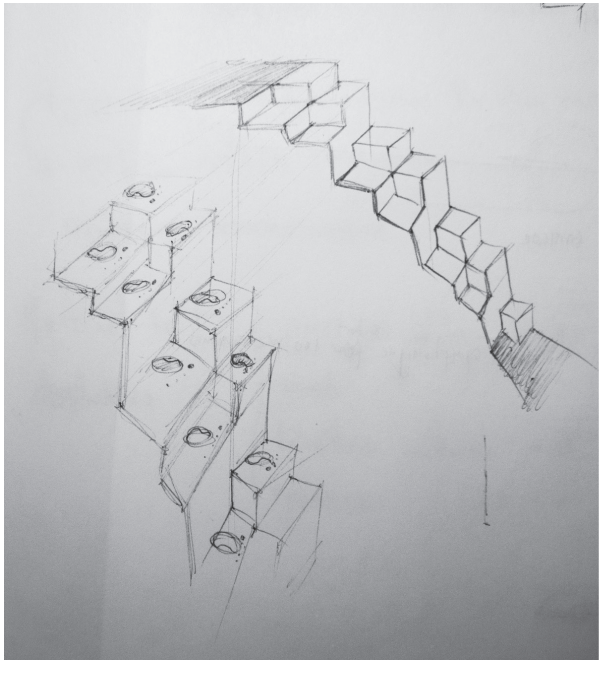
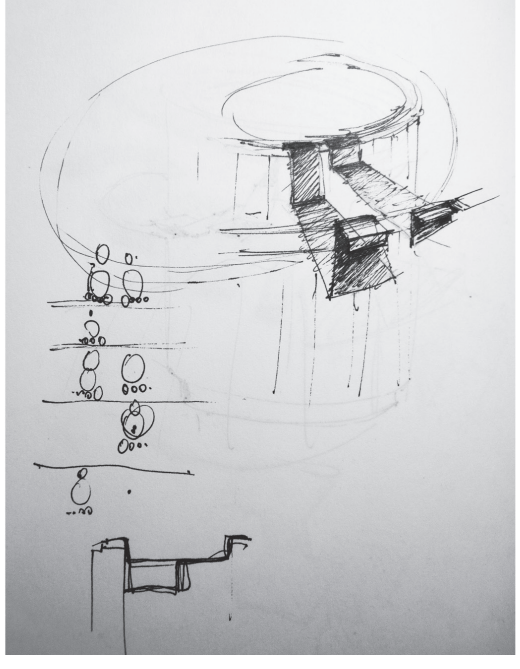
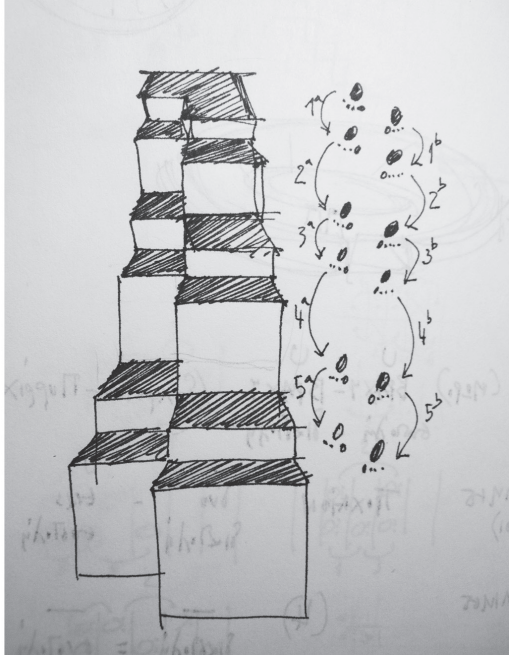




Fig. 13 Women's ritual dance 340 B.C. Samothrace and detail with funeral scene from Late Geometric ("Dipylon") krater / gravemarker by the "Hirschfeld Painter," ca. 750-740, Athens
Fig. 14 Bilateral movement at the staircase

BY-NC

in bo Ricerche e progetti per il territorio, la città e l'architettura
ISSN 2036 1602
NUMERO 8 - dicembre 2015

not only the internal form of the metre but its groupings as well (Fig.14).

VII. Step - Respiration - Cardiac Function

The correlation of muscular and cardiac function constitutes the key to understand how the spatial element of the staircase influences the individual's perceptual field. We argue that what is first influenced is the sense of rhythm.
Both during ascent and descent our step follows a cyclic repetitive movement that consists of two distinct phases: swing and stance. The phases alternate to each leg so that when one foot is in stance phase, the other one is in swing phase. Within the periods of transition from one foot to the other short double support periods occur. The previous analysis convinces us that in the case of the ascent or the descent, we can distinguish bilateral structure of the leg move to arsis (lifting) and thesis (setting).
The aforementioned moves are achieved by contraction of the relevant muscles. Increasing muscle function requires concentration of more blood and oxygen which in turn require intense contractions of the heart (more frequent and stronger pulses) to move through the arteries and capillary.
The heart contracts stronger and faster, through the sympathetic nervous system, (Kandel, Schwartz, Jessell, 2000) to transfer more blood and oxygen to the muscles involved with the movement. As a result of this process, the heart rate increases and synchronizes with the rhythmic bilateral structure of the leg moves to arsis (lifting) and thesis (setting).
The rhythmic order, easily understood in the previous sections of the time scale of the pulse, is only one of the elements that characterise it, according to Herophilus. Other elements are: size, speed, strength, order-ataxia and normality-abnormality.

VIII. Movement - Memory

Perfect synchronisation of the movement of both our legs when we descend or ascend a staircase, is prerequisite for the development of their two continuously opposing movements to achieve the overall movement of the body. Synchronization requires proper function of Vestibular system of the brain which controls our central nervous system and accordingly our Proprioceptive sense that is our ability to synchronize our body parts when moving. Our neuronic network is nowadays considered to constitute the human memory mechanism as well.
Accordingly, any distinction of the motor model -as for example the different patterns of movement proposed in the designed burial staircases- initially activates the mediation of the upper central nervous system, and it then modifies already existing synapses of neurons, strengthening them or even leading to new collateral ones. In this way, each new "record" activates a process of quantitative or qualitative, morphological or functional changes.
In terms of the stored motor model, we can easily recognise the bipole position (thesis) – lifting (arsis) that also characterises the cardiorespiratory system. The mediatory character of the nervous system, as it was roughly described previously, indicates on one hand that both memory and perception are directly linked and on the other hand that the data from both memory and perception are never directly accessible, but they are only activated by the interaction of the subject with an object. Furthermore, memory is not a "databank", but rather an encoding that is activated whenever required. So any recall does not refer to the same things but in some condensers of those, who either have neurobiological either linguistic substrate (Touloumis, 2005).
The rhythm could be a kind of common encoding of both our operating system i.e. the network of neurons and the linguistic behaviour which translates our physical experience into symbolic representations (through words).

IX. Heart rate - Music

As previously mentioned, heart beat is only controlled by the autonomic nervous system.

BY-NC

Ricerche e progetti per il territorio, la città e l'architettura
ISSN 2036 1602
NUMERO 8 - dicembre 2015

There is no possibility of any direct, conscious influence on them.
Yet, pulse is associated with music and movement not exclusively indirectly (through other physiological processes). We are particularly interested in the tempo of heartbeat -although we usually are not conscious of the exact value of tempo- since it is a measure for comparison and recall of psychological states. Whenever we hear sounds, enunciate syllables or pace in a tempo larger than normal tempo of 60-80 beats per minute, a feeling of alertness is automatically created. In contrast a feeling of relaxation corresponds to a lower tempo. In this way inner psychological states associated with fast or slow heart beats are recalled, although their primary stimulus is external. So the link between the heart rate tempo and the corresponding psychological state is empirically inscribed.
Music theory refers to psychological consequences, usually resulting from the comparison of the normal tempo heartbeat of (60-80 pulses) with any music tempo (Winckel, 1967.) But if the problem was just a matter of comparison, then, whenever we would have tachycardia and at the same time we would listen to a fast tempo, we would experience the situation as a state of balance. However, even in a state of tachycardia, fast tempo causes us extra stress, recalling similar experiences.

Accordingly, we believe that experiences associated not only with heart rate tempo but with rhythm too, have been recorded inside us. Heart rate refers to a repeating metre and a corresponding tempo, within which rhythm is established. The interior organization of the metre is achieved by individual rhythmic accents, duration and intensity of systole and diastole. The rhythm of heart beat varies with age, sex, physical and pathological state of the organism. These rhythms are easily recorded by electrocardiograms, where we do not simply measure the number of pulses per minute (tempo), but mostly we record the rhythm, that is the inner state of the pulse.
Eventually, it seems that breathing and stepping are involved in the design of any music – dance work, differently than heartbeats do. We claim that breathing and stepping are involved in music composition by organizing and being organized. On the other side, although there is no possibility of any conscious organization of heartbeats they do participate in the overall composition as they serve as a measure for comparison and recalling of former experiences.
Metre results from breath and step anthropometric data and is translated as time while tempo results from heart beats. The total composition refers to the control of breathing and stepping, as compared to the rhythmical variations of the heartbeat.

X. Step and space

In our study, we replace the ancient unity music-dance with the unity architecture-dance. They, who follow the ritual, are not led by the material elements of music, that is the sounds, but by spatial data, the stairs that evoke a specific choreography.
We believe that if we "transfer" the structural characteristics of rhythm in music to another discipline, to architecture in our case, we could create similar experiences. The new architectural element should also affect breathing and stepping, as compared to the rhythmical variations of the heartbeat. Tempo and metre relate to those quantitative space intonations that mainly concern the anthropometric data of step.
At this point we will make a small parenthesis referring to the concept of rhythm. Rhythm in music is defined as the grouping of sounds differentiated in ways of duration, intensity, and frequency (Sadie, Tyrell, 2001). Thus rhythm establishes a succession of intonations in time. In antiquity intensity accents did not exist (dynamic accents). All intonations concerned duration (agogic accents) and quality, i.e. the pitch (tone accents).
The temporal perception in architecture refers to both the duration that space bears itself, when it is considered to be a succession of elements, and to the duration being perceived by the walker during his movement

BY-NC

Ricerche e progetti per il territorio, la città e l'architettura
ISSN 2036 1602
NUMERO 8 - dicembre 2015

in space. The former (duration) becomes rhythmic through qualitative accents, while the latter (duration) becomes rhythmical, through quantitative accents in time. The overall rhythmic organization arises as a composition of both types of accents.
By associating bodily movement data in staircase to our internal organization data such as respiration, pulse, stepping, we enrich the design field of motion. So our original request can be reduced to the design of these elements (Fig. 15).

Fig. 15 Photorealistic version of the project's model

References
Andrew Barker, *Greek Musical Writings, Volume II, Harmonic and Acoustic Theory,* Cambridge University Press, Cambridge, 1989
Charles Daremberg and Charles Emile Ruelle, *Oeuvres de Rufus d' Ephese, Adolf M. Hakkert,* Amsterdam, 1963
Eric Kandel, James Schwartz, Thomas Jessell, *Principles of Neural Science,* McGraw-Hill, New York, 2000
Donna Kurtz and John Boardman, *Greek Burial Customs,* Thames and Hudson, London, 1971
Erwin Panofsky, *Meaning in the Visual Arts,* Doubleday Anchor Books, Garden City, N.Y., 1955
Jerome Pollitt, *The Ancient View of Greek Art: Criticism, History, and Terminology,* Yale University Press, New Haven and London, 1974
Stanley Sadie and John Tyrell, *The New Grove, Dictionary of music and musicians,* Grove, Oxford, 2001
Antonis Touloumis, *Issues of inscription in temporal experience* in Van Nes, A. (ed.), Proceedings of the Fifth International Space Syntax Symposium, University Of Technology, Delft, Vol. II, p.421-430 2005
Martin Litchfield West, Introduction to *Greek Metre,* Oxford University Press, Oxford, 1987
Fritz Winckel, *Music, sound and sensation, a modern exposition,* Dover Publications INC, New York, 1967

BY-NC